"The kinds of these animals, the relations they bear to one another and to the larger animals (such as whales, seals, &c., towards whose food they so largely contribute), the conditions under which they live, the depths they inhabit, their changes of form, &c., at different seasons of the year, and at different stages of their lives, and, lastly, their distribution according to geographical areas, warm and cold currents, &c., are all subjects on which very little is known.

"In connexion with this subject, and, indeed, inseparable from it, is a similar inquiry into the conditions of life of the microscopic vegetables with which the Polar seas equally swarm, and which both form the food of the microscopic animals and contribute to the sedimentary deposits above mentioned—the siliceous coating of their cells. These siliceous coats are indestructible, and being of irregular geometric forms, and the different kinds having differently and exquisitely sculptured surfaces, may be recognised wherever found, and at all future epochs of our globe; and a knowledge of the species inhabiting the Arctic Ocean would throw great light on investigations into the age of the rocks of our own island, and on the later changes of the climate of the Northern hemisphere.

"With regard to the larger animals, the fish, shells, corals, sponges, &c., of the Arctic zones, those of Greenland alone have been well explored. A knowledge of their habits and habitats is most desiderated, as are good specimens for our museums. More important still would be anatomical and physiological experiments and observations on these animals under their natural conditions.

"In botany very much remains to be done; not perhaps in the discovery of new kinds, but in tracing the distribution of those already known, in connexion with existing currents, and with the effects of the cold and warm epochs of the world's late history. It is well made out that the Arctic flora comprises three floras—namely, the Scandinavian, American, and Asiatic; but it has only recently been shown that these floras do not bear that relation to the geographical areas they respectively inhabit, which the existing relations of land and sea would lead us to suppose: thus the West Greenland flora is European, and not American; the Spitzbergen flora contains American plants found neither in Greenland nor in Scandinavia; and other anomalies have been traced which indicate great recent changes in the physical geography of the Polar land. To correlate and explain these anomalies requires a Natural History survey of the Polar area, and can only be accomplished by the joint labours of energetic officers, who could devote a considerable time to the subject."

I have the honour to be, Sir,
Your most obedient servant,
GEORGE BUSK, Secretary.

To the Secretary of the
Royal Geographical Society.

NOTES TO MR. MARKHAM'S PAPER.

NOTE (A) *on the Objection to the Smith Sound Route for North Polar Exploration, founded on the existence of Ice Obstructions in Baffin's Bay.*

THERE are two roads to the North Pole—one by the Spitzbergen Seas, and the other by Baffin's Bay; and both these roads are barricaded at their entrances —one by the Polar pack, and the other by the middle ice of Melville Bay.

Of the Polar pack we know nothing, except that Parry walked over it for 192 miles and found no indication of its coming to an end, and that, as there is no land-ice along which to pass it, any attempt to do so must be dependent on the will and pleasure of the drifting ice. There is no authentic record of any vessel having ever passed through it; its width and character (except that it is at least 200 miles broad in August, and that its ice-fields are often 40 feet thick) are utterly unknown.

On the other hand, the middle ice of Melville Bay is as well known as the route round Cape Horn. Fleets of whalers have annually passed through it ever since 1817, and no less than thirty-eight times have exploring vessels braved its dangers since the days of stout old Baffin.

By starting early in the season and sticking to the land-floe, this middle pack may be successfully passed every season, in all human probability. This is considered so certain that Sherard Osborn, in his able proposal for North Polar Exploration, did not even allude to a difficulty which, when the above conditions have been observed, has invariably been overcome. But an objection to the route for North Polar Exploration, by way of Smith Sound, has since been raised, on the ground that it is dangerous to attempt the passage of Melville Bay. It has, therefore, become necessary to state the simple facts bearing on this subject—facts well known to every Arctic navigator, and which will, I think, most readily be appreciated by an examination of a tabular statement of all previous exploring voyages made up Baffin's Bay.

It is to be remembered that the whalers do not come under consideration at all. If there is not a good prospect of reaching the "North Water" early in the season, they turned back and fished elsewhere, so that their experiences of Melville Bay detention go for nothing. Yet Scoresby has shown that, between 1817 and 1849, there is not a year in which one or more whalers did not reach the "North Water." In the years 1825, 1827, 1828, 1832, 1833, 1834, the whole fleet reached the "North Water" in June. The almost annual destruction of whalers by the ice has also been mentioned. But they are not strengthened like exploring vessels; and the fact that not a single exploring vessel has ever been destroyed in Baffin's Bay, is more than a sufficient reply to this objection. It must, however, be remembered, that even when whalers are lost, their crews are perfectly safe. If they are not taken on board by other whalers, as is usually the case, a retreat in boats from Melville Bay to the Danish settlements in Greenland is perfectly easy.

But we have to do with exploring vessels and not with whalers. First, then, we have the fact that *exploring vessels have passed through the ice of Melville Bay* THIRTY-EIGHT TIMES, *and not one has been lost.* So much for the risk and danger of this navigation.

The second and only important consideration is the probable detention by the ice; for if the "North Water" can be reached before the close of the navigable season in September, the arrival of vessels on the west coast of Smith Sound is a certainty.

The tabular statement on page 160 shows the average detention in Melville Bay, and the time each exploring expedition has taken in passing through the ice.

It will be observed that four expeditions have made extraordinarily rapid voyages up Baffin's Bay, namely, Parry in 1819, Ross in 1829, Inglefield in 1852, and Kane in 1853. They can scarcely be said to have experienced any detention at all.

Two also have been very unfortunate, namely, the *North Star* in 1849, and the *Fox* in 1857. The *North Star* reached the ice very late in the season, took the pack, and was eventually drifted into the "North Water," but after the navigable season was over. The *Fox* did not sail until very late; but in the following year, when she arrived at the edge of the ice in June, she reached the "North Water" in a few days, without difficulty. There were other causes for

TABLE showing the Period of Detention by Ice of the several Exploring Expeditions up Baffin's Bay.

Expedition. Ships.	Tonnage.	Commanders.	Year.	Date of Sailing.	Stopped by Ice.	Reach "North Water."	Days detained.	Remarks.
1. *Discovery*	55	BAFFIN	1616	Apr. 19	June 9	July 1	22	"North Water" anew revived the hope of a passage.
2. *Alexander*	252	ROSS	1818	Apr. 18	July 2	Aug. 8	38	
3. *Isabella*	385							
4. *Hecla*	375	PARRY	1819	May 11	July 21	July 28	7	The pack this year was only 80 miles wide, and very loose. Parry took the pack.
5. *Griper*	180							
6. *Hecla*	375	PARRY	1824	May 19	July 17	Sept. 9	54	The ice was 100 miles further north than it was in 1819.
7. *Fury*	377							
8. *Victory**	150	ROSS	1829	May 23	July 29	Aug. 5	5	The luckiest voyage on record. He took the pack.
9. *Erebus**	370	FRANKLIN	1845	May 26	..	..	..	Franklin got through in time to sail up Wellington Channel, round Cornwallis Island, and back to Cape Riley.
10. *Terror**	340							
11. *Enterprise*	540	JAMES ROSS	1848	June 12	July 26	Aug. 20	25	
12. *Investigator*	480							
13. *North Star*	500	SAUNDERS	1849	May 26	July 30	Sept. 26	57	He took the pack, and was carried across Melville Bay in it.
14. *Resolute*	410	AUSTIN	1850	May 3	July 1	Aug. 15	45	
15. *Assistance*	430							
16. *Pioneer**	430							
17. *Intrepid** (60 H.P.)	430							
18. *Lady Franklin*	200	PENNY	1850	Apr. 13	July 1	Aug. 14	44	See Dr. Sutherland's 'Remarks on the passage of Melville Bay,' i. 174.
19. *Sophia*	100							
20. *Felix*	..	ROSS						
21. *Prince Albert*	..	FORSYTH						
22. *Advance*	144	DE HAVEN	1850	May 22	July 8	Aug. 12	35	
23. *Rescue*	91							
24. *Prince Albert*	..	KENNEDY	1851	May 22	..	..	..	"A very favourable voyage through the ice."
25. *Assistance*	..	BELCHER	1852	Apr. 21	June 23	July 31	38	
26. *Resolute*	..							
27. *Pioneer**	..							
28. *Intrepid**	..							
29. *North Star*	..							
30. *Isabel** (16 H.P.)	149	INGLEFIELD	1852	July 6	..	..	0	No detention.
31. *Phœnix**	..	INGLEFIELD	1853	..	July 16	July 25	9	
32. *Phœnix**	..	INGLEFIELD	1854	..	July 22	Aug. 21	30	He took the pack on the 3rd of August.
33. *Talbot*	..							
34. *Breadalbane*	..							
35. *Advance*	144	KANE	1853	May 30	..	..	10	Took the pack and made direct for Cape York.
36. *Fox**	177	M'CLINTOCK	1857	July 1	Aug. 12	Sept. 18	Winter in pack.	Took the pack and had to winter in it.
37. *Fox**	..	M'CLINTOCK	1858	..	June 18	June 27	9	
38. A schooner	133	HAYES	1860	July 10	..	..	0	Entered Smith Sound on Aug. 27th.

Average . . . . . 29 days' detention.
Sailing-vessels . . . . . 32 ,,
Steamers . . . . . 22 ,,

* Steamers.

for the *Fox*'s failure.* She had not sufficient manual-power, steam-power, nor impetus to force the floes asunder; and M'Clintock himself says: "I am convinced that a steamer of moderate size and power, with a crew of forty or fifty men, would have got through a hundred miles of such ice in less time than we have been beset." † The case of the *Fox*, therefore, is not one which can fairly be used in arguing that the middle pack is in the least likely to stop an expedition proceeding to Smith Sound. The same may be said of the *North Star*; for, in the first place, she was not a steamer but a sluggish old tub, and, in the second, she sailed too late in the season. Had she been early, she would have got through; we know this because the *St. Andrew* of Aberdeen, in the very same year, reached the "North Water" on June 12th.

When the ice is drifted out of all the seas whose portals are Lancaster, Smith, and Jones sounds, it leaves open water round the head of Baffin's Bay during the summer, the southern limit of which extends from Pond's Bay to Cape York. This is called the "North Water," and it is always navigable from June to September. During the same period the great body of ice, drifting south, generally blocks up the central part of Baffin's Bay, and is called the "Middle Pack." But, owing to the lay of the land, a mass of ice remains fixed to the shore round Melville Bay; and this fixed ice, being older than the pack, and also being firmly attached to the land, is almost always found to be stronger than the drifting ice.

The reason why exploring vessels have, with two exceptions, always successfully reached the "North Water," is quite clear. Instead of having no choice but to take the pack, as will be the case with vessels sailing towards the Pole in the Spitzbergen seas, the ships going up Baffin's Bay can avoid all such uncertain navigation by keeping fast to the land-floe in Melville Bay. Whenever the wind blows off shore, the pack drifts away while the land-ice remains fixed, and a lane of water is thus formed through which the vessels may steam on their course.‡ On the other hand, when the wind is from seaward, the land-floe is a source of protection; for, as the drifting floes press against it, a dock is cut in the land-ice, and the ship rides in safety.§ The pack crushes up against the friendly land-ice, which almost invariably proves the stronger of the two. But even with an unfavourable south wind, good progress is often made. The floes of ice are of irregular shape, leaving pools and lanes between them, and a steamer of 60 horse-power can charge the tongues of ice which separate these lanes, and so, with the aid of blasting, often pass from one to another. The distance across Melville Bay is 172 miles, and the ice is usually first met with, so as to become obstructive, off Cape Shackleton, at its southern entrance.

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* Nothing shows the uncertainty of ice-navigation more strikingly than the comparison between the luck of Inglefield in 1852, and the ill-luck of M'Clintock in 1857. Inglefield, though he did not sail until July 6th, passed through Melville Bay with scarcely a stoppage, while the *Fox*, sailing on July 1st, had to winter in the pack.

† M'Clintock's 'Fate of Franklin,' p. 45.

‡ The earlier in the season the passage through Melville Bay is attempted, the greater the chances are of expeditiously passing through it. The land-ice is then fixed, and the pack moves off in one entire body from it, under the influence of the tide if the wind is not from the southward, a circumstance which is not by any means common during the spring months; compared with July, August, and September. When the wind is northerly an extensive open space occurs between the two ices, through which a ship may run without being delayed a moment by the drifting ice. The whaler *St. Andrew*, of Aberdeen, thus got into the "North Water" in the beginning of June. Whalers that attempted it in the same year, late in the season, had great difficulties.—'Sutherland,' i. p. 175.

§ For a diagram of a dock in the land-ice, see McDougall's 'Voyage of the *Resolute*.'

An examination of the Table will show that three vessels (in 1819, 1829, and 1853) have entered the pack, and, by extraordinary luck, got through it in a few days, and thus had the whole navigable season before them in the "North Water." But taking the pack is a very hazardous and uncertain course to pursue, as the case of Parry in 1824 sufficiently proves. Then, again, one or two vessels (Inglefield, for instance, in 1852) have passed through Melville Bay in a day or two, with scarcely any detention at all.

We must, however, while hoping for the best, only calculate from the average of voyages. We find, then, that *no vessel has ever been lost*, and that the average detention for steamers in Melville Bay, many of them under exceptionally unfavourable circumstances,* has been twenty-two days. Curiously enough, this is exactly the time that it took brave old Baffin to cross Melville Bay in 1616, in a little craft of 55 tons.

It may, then, be calculated upon, humanly speaking, that two screw-steamers of 60 horse-power will get through the middle pack in about twenty-two days.† We may rely upon this, both from an examination of all former voyages (in thirty-six of which, out of thirty-eight, the obstruction of the middle pack was overcome) and from a consideration of the nature of the ice in Melville Bay, and the means of passing through it.

Once in the "North Water," there is invariably a navigable sea to Smith Sound, at the entrance of which Captain Inglefield saw open water to the horizon, stretching through seven points of the compass.

NOTE (B) *on the alleged Attainment of very high Latitudes, by Whalers in the last and preceding Centuries.*

WHEN Captain Sherard Osborn was preparing his paper on the "Exploration of the Polar Region," I compiled a table of alleged voyages towards the North Pole for him, including many wonderful stories of high latitudes said to have been attained in the last and preceding centuries. The table was printed at the end of Captain Osborn's paper, and was merely intended for the amusement of those who are curious in such matters.

These stories were humorously alluded to by Captain Osborn,‡ but they have since been seriously made use of as an argument in favour of the Spitzbergen route; and it therefore becomes necessary to examine what they are worth. Most of them were industriously collected by Mr. Daines Barrington, and satisfactorily disposed of by Scoresby, in his great work on the Arctic Regions. That careful and accurate writer showed that all the stories of vessels having reached a higher latitude than 84°, were obtained at second hand, and were utterly untrustworthy; and that even many of those of whalers having reached 82° and 83°, were told by persons who had heard it from others, or by seamen who spoke it from memory, twenty, and in some cases thirty, years after the voyages in question were stated to have been made. But the strongest proof of the untrustworthiness of such testimony is to be found in the fact that three whaling captains asserted that they had reached 81° 31′, 81° 30′ and 82° 15′ N. respectively, in the very longitude and in the very year in which Captain Phipps was stopped by an impenetrable barrier of ice in 80° 48′ N.§ If it is maintained that the whaling captains were better observers

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* The *Pioneer* and *Intrepid*, for example, were clogged and delayed by having to tow the *Resolute* and *Assistance*.

† It will be hard indeed if powerful steamers cannot do as well as Baffin's little 55 ton fly-boat.

‡ See page 6 of his paper.

§ See page 30 of the pamphlet containing Captain Osborn's paper.

than the scientific staff of Phipps's Expedition, their stories may consistently be believed, but not otherwise.

When, instead of collecting these hearsay tales, Mr. Barrington asked the Dutch skippers themselves, he got the simple truth from them. "We can seldom," they said, "proceed much higher than 80° 30′ N., but almost always to that latitude." Scoresby once reached 81° 12′ 42″ N.*

The truth is that there is not a shadow of evidence that any ship has ever passed through the Polar pack, and the latitude reached by whalers has depended upon the position of this pack in each season. When there is an early summer, the pack drifts south earlier, and is met with sooner; and when the season has been very severe, it remains closely packed to the northward until much later. In the latter case, it may be that whalers have gone up as far even as 83°, though there is no authentic record of such a voyage. But it seems to be forgotten that the more open water there is round the seven islands to the north of Spitzbergen, the more close and impenetrable will the pack be when it is reached; and that, on the other hand, the sooner the ice is met with, the longer it will have drifted, the looser it will be, and the better chance will there be of boring through it.

Such is the evidence at present before us of whalers having reached incredibly high latitudes. It is utterly worthless.

But Captain Jansen (the author of that charming account of the phenomena of land and sea breezes, in Maury's 'Physical Geography of the Sea') is now engaged in examining some of the ancient Dutch logs, which are still extant, in order to set this matter at rest, and he has kindly promised to transmit the result of his researches to me. He has found a speech made by the learned Pontanus in 1646, in which he says that it is much warmer in 82° north of Nova Zembla than in 76°; but he adds that it is difficult to get there; and still more so to get back; and he, therefore, does not advise any one to try to reach Cathay by that route. With this ancient opinion before him, Captain Jansen will now proceed to search for the data on which it was founded.

ADDITIONAL NOTICES.

(Printed by order of Council.)

1.—*Notes on the Ice between Greenland and Nova Zembla; being the results of Investigations into the Records of Early Dutch Voyages in the Spitzbergen Seas.* By Captain JANSEN, of the Dutch Navy.

Communicated through Mr. C. R. MARKHAM, Sec. R. G. S.

BEFORE giving the results of my investigations concerning the voyages of early Dutch navigators into the Arctic regions, I must premise that I have not been able to find any ships' logs or journals, except those of the voyages of Linschoten and of Barentz. The latter has been printed by the Hakluyt Society.

I believe that our whalers at that time (1613–1750) did not keep regular written logs. It was not the custom of fishermen to do so;

* The Board of Longitude and Sir Edward Parry considered that this was the highest latitude ever reached by a ship, of which there was any authentic record.